

REMARKS

Claims 1-25 have been examined. Claims 1-24 have been rejected under 35 U.S.C. § 103(a). Also, the Examiner has indicated that claim 25 contains allowable subject matter.

I. Rejection under 35 U.S.C. § 103(a) over U.S. Patent No. 6,155,664 A to Cook (“Cook”), in view of U.S. Patent No. 6,044,694 A1 to Anderson et al. (“Anderson”).

Claims 1-16 and 18-24 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Cook in view of Anderson.

A. Claim 1

Applicant submits that claim 1 is patentable over the cited references. For example, claim 1 recites a piezoelectric device for detecting liquid within a container body. A characteristic value is detected based on a signal output from the piezoelectric device. The signal indicates a residual oscillating state of a vibrating portion of the piezoelectric device. Further, the characteristic value changes based on phenomenon that the residual oscillating state changes corresponding to a liquid consuming state.

The Examiner acknowledges that Cook fail to teach or suggest the detection of a characteristic value, but contends that Anderson does. However, Anderson merely discloses that viscosity (or liquid level) can be measured by measuring the effects of viscous damping on the vibrating structure, where an output signal is proportional to an amplitude of vibration (col. 5, lines 17-24). The output signal is disclosed as being correlated to viscosity (col. 5, lines 24-25). Anderson further discloses that density measurements can be taken to measure the effects of

mass loading on the vibration of a bender structure, by monitoring the frequency of the output voltage (col. 6, lines 37-45). Such disclosure, however, suggests that an oscillation or vibration state is measured during the application of a drive voltage. On the contrary, as set forth above, claim 1 recites that the claimed characteristic value is detected based on a “residual” oscillating state. The “residual” oscillating state is a free oscillation that occurs after the piezoelectric element is forcibly vibrated by applying a drive voltage (i.e. as disclosed in the non-limiting embodiment on pgs. 43-44 of the present Application, a “residual” oscillation is a free oscillation). Therefore, the detection of values disclosed in Anderson fails to disclose the detection of the claimed characteristic value.

Accordingly, since Anderson fails to cure the deficient teachings of Cook, Applicant submits that claim 1 is patentable over the cited references.

B. Claim 2

Applicant submits that claim 2 is patentable over the cited references. For example, claim 2 recites that the detecting step is executed at a time that the liquid container is mounted on the ink jet recording apparatus.

Anderson fails to disclose that any characteristic values of the piezoelectric devices 50, 52, 54 are detected at a time the container 30 is mounted onto an apparatus. The Examiner therefore maintains that Cook discloses a detecting step at the time of mounting a container to an ink jet recording apparatus in steps 54-60 (Fig. 3). However, steps 54-60 do not detect a characteristic value of a piezoelectric device. Rather, as disclosed in Cook, Fig. 3 depicts a

process to determine whether a second quantity of ink in a remote ink cartridge 8 is compatible with a first quantity of ink in a printhead cartridge 2, based on information provided during manufacture (col. 7, lines 41-44). When the cartridge is installed, the printer controller 36 accesses memory device 12 to determine a specified color (col. 8, lines 1-6). Alternatively, the printer controller 36 will read an identification number stored in the memory device 12 to determine a match with the ink cartridge memory device 14 (col. 9, lines 14-26). In another embodiment, the printer controller 36 accesses the cartridge memory device 12 upon installation, to retrieve a primary drop count (col. 11, lines 5-15).

As stated above, however, the information retrieved from the memory device 12 is information that was previously written to the memory device 12 during manufacture. There is no suggestion that any information other than the information previously written to the memory device 12, is detected upon installation. Since Anderson likewise fails to disclose that any detection of a characteristic value of the piezoelectric devices are performed during mounting of a liquid container, Applicant submits that even if taken together, the references fail to teach or suggest the claimed features. Rather, it appears that the rejection is based on impermissible hindsight reasoning.

Accordingly, Applicant submits that claim 2 is patentable over the cited references.

C. Claims 8, 10 and 16

Since claims 8, 10 and 16 contain features that are analogous to the features recited in claim 1, Applicant submits that claims 8, 10 and 16 are patentable over the cited references for at least analogous reasons as presented above.

D. Claims 3, 4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 18, 19 and 24

Since claims 3, 4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 18, 19 and 24 are dependent upon one of claims 1, 8, 10 and 16, Applicant submits that such claims are patentable at least by virtue of their dependency.

E. Claims 20 and 22

Applicant submits that claims 20 and 22 are patentable over the cited references. For example, claims 20 and 22 recite that a consumption state of liquid in a liquid container is based on a relative condition of mutual oscillation characteristic values of at least two piezoelectric devices.

The Examiner acknowledges that Cook fails to disclose the above features, but contends that Anderson does. In particular, the Examiner refers to column 4, lines 4-15 of Anderson, as disclosing the claimed feature. However, the cited portion merely discloses that three piezoelectric benders may be used in a mixing vessel to determine both fluid level and viscosity. The reference is completely silent as to the use of mutual oscillation characteristic values of at

least two of the benders to determine the level of ink. Accordingly, Applicant submits that Anderson fails to cure the deficient teachings of Cook.

In view of the above, Applicant submits that claims 20 and 22 are patentable over the cited references.

If the above rejection is to be maintained, Applicant respectfully requests the Examiner to specifically indicate where the recitation of claims 20 and 22 is shown in either of the references. In regard to the claimed mutual oscillation characteristic values, Applicant directs the Examiner's attention to the non-limiting embodiment of pg. 15, lines 22-34 of the present Application.

F. Claims 21 and 23

Applicant submits that claims 21 and 23 are patentable over the cited references. For example, claims 21 and 23 recite that a relative condition of the oscillation characteristic values is that oscillation characteristic values of at least two piezoelectric devices are approximately equal to each other.

Anderson fails to teach or suggest that a relative condition of the oscillation values of at least two of the piezoelectric benders is a condition where the oscillation characteristic values are approximately equal to each other. Since Cook fails to cure the deficient teachings of Anderson, Applicant submits that claims 21 and 23 are patentable over the cited references.

In addition, since claims 21 and 23 are dependent upon claims 20 and 22, respectively, Applicant submits that such claims are patentable at least by virtue of their dependency.

If the above rejection is to be maintained, Applicant respectfully requests the Examiner to specifically indicate where the recitation of claims 21 and 23 is shown in either of the references.

II. Rejection under 35 U.S.C. § 103(a) over Cook in view of Anderson and further in view of U.S. Patent No. 5,610,635 A to Murray et al. (“Murray”).

Claim 17 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Cook in view of Anderson as applied to claim 1 and 16 above, and further in view of Murray.

Since claim 17 is dependent upon claim 16, and Murray fails to cure the deficient teachings of Cook and Anderson, in regard to claim 16, Applicant submits that claim 17 is patentable at least by virtue of its dependency.

III. Allowable Subject Matter

As noted previously, the Examiner has indicated that claim 25 contains allowable subject matter. Accordingly, Applicant has rewritten claim 25 into independent form.

IV. Newly Added Claims

Applicant has added claims 26-44 to provide more varied protection for the present invention.

V. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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